

nervous system; and in reference to injury to the chief nerve or nerves the same remark will almost apply. We do not amputate the leg because the sciatic nerve is rent asunder. The true principles of surgery would dictate a pause—a period for watching and observation. But as the rupture, whether of artery or nerve, is commonly a matter of uncertainty, we can only judge by consequences, and for these we should wait.

“To justify amputation, from rupture or laceration of the muscular system of a limb, the injury must be very great, because the constitution does not sustain a shock in proportion to the extent of the injured surface, supposing the integuments to remain unbroken: but if the muscles be largely torn, and the investing integuments detached, and not susceptible of entire, or nearly entire replacement, I confess such an injury would justify a doubt as to the power of Nature to restore the parts to health. I speak of very large laceration, with confusion of muscle, coupled with separation of integument and extravasation of blood.

“I do not concur with many surgeons, who deem exposure of the cavity of a joint an important element of failure. I am quite aware that it is so generally deemed, and I recall to my recollection the early part of my own professional life, when a compound dislocation of a joint alone was deemed a warrant for the amputation of a limb. But I can bear witness to many cases of recovery as regards the limb, and a few of recovery to the joint itself.

“Undue importance appears to me to be attached also to fracture into a joint, as though such fracture, in reference to the retention of a useful limb, raised a serious obstacle to recovery. That it places the joint in jeopardy I readily allow, but I do not believe that the advocate for amputation in any given case can derive from its presence an argument of great force, although I do not deny that it should always be considered an aggravation of the mischief done. The same remarks will apply to fracture of the bone, especially if comminuted, when superadded to the larger injury of rupture of the main artery, or of the main nerve, extensive rupture of muscles, or laceration and disorganization of the integuments.

“I have never yet observed much advantage to accrue to the patient from the introduction of the finger through an opening in the skin, which is employed as an explorer, and carried round in all directions, for the purpose of ascertaining the nature and extent of the injury done. I have never, myself, acquired much knowledge by this process, which could be rendered available to the service of the patient, nor have I known it to be obtained by others. To the patient himself, so far as he is entitled to an opinion, it has always appeared to be positively objectionable. To be sure, it gratifies curiosity, though at some expense of suffering.

“Finally, in all doubtful cases, I would give the benefit of the doubt to the patient, and endeavour to restore the limb. If, consequent on a large injury to the leg or thigh, upper arm or forearm, the foot or hand lose their natural warmth, amputation is the only resource. If we find extensive laceration of muscles, with extensive separation of integument, and especially if the integument be disorganized and insusceptible of replacement, I fear we must amputate, even without waiting for the above evidence of loss of vitality in the extremity; but, in a subject moderately healthy, I do not consider that any degree of comminution of bone or laceration of muscles, unless very extensive, any fracture into a joint, or compound dislocation of a joint, can justify the abandonment of the case, so long as the structures are capable of some general replacement, and the patient can submit without suffering to the restraint necessary to his recovery.”

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25. *Difference between the Mortality after Amputation for Injuries and Diseases.*—In our July No., p. 242, we gave a report of a paper communicated to the Royal Medical and Chirurgical Society, by Mr. Hussey of Oxford, containing a registry of 164 cases of amputation, which were performed in the Redcliffe Infirmary. Mr. JAMES, Surgeon to the Devon and Exeter Hospital, has made (*Med. Times and Gaz.*, Nov. 1, 1856) some interesting remarks on an

important part of that paper, viz: "The great relative amount of mortality after amputation of the thigh for injuries, and the cause or causes thereof.

"Of this great mortality," he remarks, "there can be no question, although it singularly differs under circumstances which appear very similar. Thus, Mr. Erichsen is reported to have stated that 'he believed not a single case had proved successful either in the French or the British camp,' leading to the total abandonment of the operation. Such also appears to have been the case in the Seven Years' war, when Bilguer interdicted it in the Prussian army; nearly such was the case in Paris after the great conflict in 1830; while, on the other hand, Mr. Guthrie gives a widely different result as regards the experience of the Peninsular War,<sup>1</sup> and it might be supported by many others, showing that, large as the mortality undoubtedly is, and much as it would tend to deter surgeons from the operation, still it ought by no means to amount to a prohibition. These statistics are on a large scale; and certainly no limited experience, however exact, will entitle us to form a positive conclusion; but as regards civil hospitals, as far as the returns go, the same discrepancy may be observed. The results stated in the report alluded to (I believe, taken from my own tables, in part) exhibit on no less an authority than that of Mr. Erichsen, a total loss of thirty-two cases in Edinburgh, Glasgow, and St. Thomas's, out of the same number of thigh amputations; while his own experience at the London University, and Mr. Curling's at the London Hospital, appears to have been more favourable (and many others might be added); thus, then, if the experience of military practice be compared with military; of civil hospitals in large cities with those of others; a singular amount of discrepancy is observable; and to this I will now add the comparative results of two provincial hospitals very similarly situated, which the report of the Oxford affords. In that institution, of six primary amputations of the thigh, five were fatal: in the Exeter there were eight deaths out of thirteen, as stated in the tables I constructed, and which are contained in two memoirs in the 17th and 18th volumes of the *Transactions of the Provincial Medical and Surgical Association* (which tables may be briefly described as follows: 'I took three hundred consecutive cases of amputation of all the limbs, beginning from the period when I first became surgeon of that hospital. Of these, ninety-four proved to be for injuries; and of these sixty-eight were primary and early intermediate; twenty-six secondary and late intermediate. Of the former, thirteen were of the thigh, and eight died.')

"Pursuing this subject of the singular discrepancy in the results of amputation, it is well worthy of remark, that of the twelve primary leg amputations in the Oxford Infirmary, none died, while of eighteen in our own, seven died. But then an extract from the very valuable work of an able surgeon, now no more, Mr. Alcock, will offer a similar example. He says: 'In the first sixteen amputations performed for gunshot wounds, consisting of primary and secondary, including a shoulder-joint case, the majority of the thigh and leg, I lost but one (and that was an almost hopeless case of secondary amputation of the thigh). In the next eight I lost seven.'

"However worthy of notice these discrepancies are, there can be no doubt that they will ultimately be found to resolve themselves into definite principles governed by certain laws. They are like the perturbations of the planets, which once were equally unexplained. But to return to our more immediate subject.

"*The Mortality after Amputation for Injuries, as compared with those for Disease.*—In Mr. Hussey's report of fifty-five amputations of the thigh for disease, ten were followed by death; in my own, out of one hundred and nineteen, there were ten; here, again, it is probable that, as regards the former, the mortality may, from some accidental circumstance, have been greater; in my own, less than the average; but take which table you will, there is no proportion between the general mortality after amputation for disease, and for injury, and take which you will, while the mortality after amputation for diseases, especially of some large classes of disease, is not alarmingly large, even in the

<sup>1</sup> He lost nine out of forty-seven of all limbs.

thigh, for that injury has justly been stated as the 'most fatal in surgery.' When the influence of concurrent diseases, as of the lungs, etc., and chance misadventures in carrying out the operation, and its subsequent treatment, are duly considered, the actual mortality for disease is not large *per se*, as in the memoirs I have alluded to, I have endeavoured to show; but this being the case, then comes the question, On what does the great amount of mortality after amputation for injuries depend? My answer is, Not on the amputation, but on the injury.

"Mr. Hunter's axiom—that it arises from the condition of health not bearing disease well—I have before combated, and there is little reason to believe it will be insisted upon, but in lieu thereof other hypotheses have been advanced, which, when duly inquired into, will, I believe, be found extremely doubtful, to say the least; in the discussion, however, to which I now refer, the phenomena thus explained occupy a prominent place. The extraordinary mortality in cases of amputation of the thigh, then, has been of late years attributed to the bone itself; to inflammation of its medullary membranes; still more to inflammation originating in the veins. At first sight there may appear grounds for these opinions, which are advocated by men of high ability, but when it is considered that in the parallel example of the arm, also in the leg and forearm, the mortality after amputation for injuries is comparatively small, the value of these hypotheses will considerably decrease; still more, when the comparative results of amputation for injury and disease are well considered with relation to the thigh itself, and with reference to this I will content myself with quoting the following passage from my second memoir: 'Very high authorities attribute this (mortality) in a great degree to a cause which, at first sight, appears to offer a ready solution, namely, that the veins within the bone are mechanically prevented from closing, as in the soft parts, and are, therefore, prone to inflammation. The facts now stated will show that, however this may be, it cannot be the real cause; for precisely the same conditions, as to the bony structure, obtain in amputations for disease, where such consequences rarely ensue, as in those for injury, in which secondary inflammation is so common; and in those for injury I may observe, that they occur in a very small proportion when the amputation is of an upper extremity, the condition remaining the same. That inflammation of veins often takes place after amputation for injury, and that secondary inflammations in other tissues also occur, is a fact, and that these, whenever they take place, are capable of exciting an additional, and often fatal, effect, is quite certain; but, it may be demanded, if veins inflame in the one case, why should they not equally in the other, if the amputation is performed through sound and healthy parts in a healthy person (primary amputation)? why should the veins inflame when the cause is an injury, so much more frequently than in the unhealthy, where it is disease?' (The bone is equally sawed through in one case as in the other, and above the injured portion.) Of this remarkable fact no explanation has ever been offered.

"If then I am justified in supposing that these hypotheses are insufficient to explain the phenomena, I may be warranted in again proposing that which I advanced in the memoirs alluded to. It is this. That the lesions which require amputation (in primary cases) are, for the most part, produced by causes which extensively crush or lacerate the part. That in those which require the amputation of the thigh, a very considerable portion of the body is involved. That the condition of the nerves in any part so crushed or torn, is very similar to that of a portion of the spinal cord as experimented upon by Le Gallois and Wilson Philip half a century since. That the effects on the system in either case constitute what we call shock. That whether the injured part is severed by amputation or not, death often ensues, as is well known, as also that if an operation is superadded at an improper period, either too soon or too late, additional injury is inflicted; but if sufficiently soon, or sufficiently late, much benefit often accrues. That, whether the part is severed or not, a train of symptoms arises from the lesion which required it. That these symptoms are very probably the consequences of changes wrought in the blood by the injury, as stated, through the agency of the nervous system, and is, so to say, more or less disorganized thereby; the effect being not very dis-

similar from that produced by the introduction of morbid poisons. That this state of the blood (not excluding that of the nervous system) is incapable, while it continues, of supporting the processes of healthy inflammation, and hence the tendency to gangrenous inflammation and phlebitis in the stump, and the diffuse inflammations, pyæmia, and pus deposits, in the system. That the powers of nature are capable, in many cases, of redeeming this state of the blood, either when amputation has been performed or not, and if not, when so redeemed amputation may very frequently be performed with success (true secondary).

"Another question arises, *i. e.*, whether this hypothesis is supported or contradicted by any other results of amputation for disease. I have already pointed out the great difference between the general results as regards the relative amount of mortality in amputation for disease or injury, but a very remarkable fact disclosed itself in my investigation of the histories of amputation for disease, as regards these especially. To render the investigation methodical, I had distributed them into classes, according to the disease for which they were performed, a plan which has not heretofore been attempted, but which is so consistent with reason, that I hope it will be. In the memoir alluded to, I divided them into two groups. The 1st, diseased joints, necrosis and caries, sphacelus senilis (chronic gangrene), malignant diseases (tumours not ulcerated), and useless limbs. These comprised one hundred and seventy-two cases of all kinds, with only eight deaths.

"In the second group, old ulcers, whether malignant or not, acute sphacelus, and acute suppurative inflammation (thecal, etc.), in all thirty-two cases, there were nine deaths. The amount of mortality in this group is, as regards the *lower extremities*, fully equal to that of amputation for injury, which, out of fifty-one cases, gave twenty-one deaths; while this, out of twenty-five cases, gave nine. And if we investigate the probable cause of this (setting aside the question of age, which must have its due weight as regards the amputation for ulcers), we shall find that the condition of the blood may be regarded as in a state very similar to that which I have supposed to be induced by injuries, *i. e.*, if not absolutely pyæmic, at all events readily disposed to be so. And consequently, the facts would tend to support the opinion I have advanced as regards amputation for injuries; at all events, not militate against them.

"To the scheme of the *Analysis of Amputations for Disease*, I may also solicit the attention of surgeons; for, if more extended inquiry shall confirm the preceding views, it is evident they will have an important practical bearing on the plans adopted. I may further be permitted to add, that when the small amount of mortality ensuing upon amputation of the limbs for diseases of joints is compared with that which has followed their excision, it may not improbably be found that the advantages gained by the latter operation do not sufficiently compensate for the risk incurred."

26. *Cases of Compound Fracture of the thigh; Primary and Secondary Amputation.*—By AUGUSTIN PRICHARD, Surgeon to the Bristol Royal Infirmary. The subject of compound fracture, and of primary and secondary amputation of the thigh, has been occasionally brought before the profession within the last few months, in the interesting records published by some of the able surgeons who have had opportunities of witnessing these accidents on a large scale in the late war. The want of success of primary amputation of the thigh, among both French and English, has been most discouraging. Writers on military surgery say most justly that the condition of the patient is generally unfavourable, and that the nature of the injury is so different from that which goes by the same name in civil surgery, that no comparison can be fairly made with reference to the results of treatment. It is obvious, without any argument, that the shattering of a thigh bone by a rifle-ball, which completely perforates the limb, must be a very different and more severe degree of injury than that produced by a fall, when the fractured extremity of the bone is thrust through the integuments. This would fully account for any want of success in treating these cases, by trying to preserve the limbs; but we must look for more general causes to account for the excessive fatality accompanying primary